



TECHINICAL DRAINAGE STUDY UPDATE NO. 2

Sunstone Phase 1A Infrastructure (Iron Mountain Road & Tee Pee Lane)

NOVEMBER 2021

PREPARED FOR:
SC East LandCo, LLC
Las Vegas, NV

PREPARED BY:
Westwood

Sunstone Phase 1A Infrastructure (Iron Mountain Road and Tee Pee Lane)

Technical Drainage Study Update No. 2

City of Las Vegas, NV

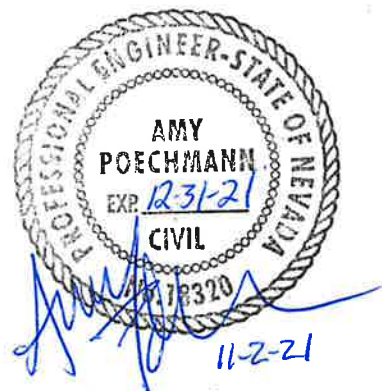
Prepared For:

SC East LandCo, LLC
9275 Russell Road, Suite 400
Las Vegas, Nevada 89148

Prepared By:

Westwood Professional Services
5725 W. Badura Avenue, Suite 100
Las Vegas, NV 89118
Phone: (702) 284-5300
Fax: (702) 284-5339

Project Number: EST1911.000
Date: November 2021



Amy Poechmann, P.E.
NV Professional Engineer No. 18320
Assisted by: Kevin Hurtado

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL
DRAINAGE STUDY INFORMATION FORM

Name of Development: Sunstone Phase 1A Infrastructure - Iron Mountain Road and Tee Pee Lane Date: November 2021
 Location of Development: a) Descriptive (Cross Streets): North/South: Tee Pee Lane
East/West: Iron Mountain Road
 b) Section: 6 & 7 Township: 19 South Range: 60 East
 c) APN: 125-06-810-006, 125-06-810-002, 125-06-501-001, 125-06-701-001 & 125-07-501-005

Name of Owner: SC East LandCo, LLC
 Telephone No.: (702) 736-9100 Fax No.: (702) 736-9200 E-mail Address: Efrain.Balizan@Lennar.com
 Address: 9275 W. Russell Road, Suite 400 Las Vegas, NV 89148

Contact Person – Name: Amy Poechmann, P.E. Telephone No.: (702) 284-5300
 *E-mail Address: Amy.Poechmann@westwoodps.com Fax No.: (702) 284-5399
 Firm: Westwood Professional Services
 Address: 5725 Badura #100 Las Vegas NV 89118

Type of Land Development/Land Disturbance Process:

☐ Rezoning	☐ Subdivision Map	☐ Clearing and grading Only
☐ Parcel Map	☐ Planned Unit Development	☒ Other (Please specify below)
☐ Large Parcel Map	☐ Building Permit	☐

1. Total Owned Land Area: At Site: approx 600 acres Being Developed/Disturbed: approx 10 acres
 2. Is a portion or all of the subject property located in a FEMA Flood Hazard Area? ☐ Yes** ☒ No
 3. Is the property bordered or crossed by an existing or proposed Clark County Regional Flood Control District Master Planned Facility? ☒ Yes** ☐ No
 4. Proposed type of development (Residential, Commercial, Etc.): Master planned community infrastructure improvements
 5. Approximate upstream land area which drains to the subject site: approximately 7.8 square miles
 6. Has the site drainage been evaluated in the past? ☒ Yes** ☐ No If yes, please identify documentation: Skye Canyon Master Drainage Study Update #5 (Sunstone MDS), CLV# DS5081

7. If known, please briefly identify the proposed discharge point(s) of runoff from the site: Moccasin Regional Storm Drain Facility,
Iron Mountain Road, Brent Lane

8. Briefly describe your proposed schedule for the subject project: ASAP



Submit this form as part of the required drainage study to the local entity which has jurisdiction over The subject property. This form may provide sufficient information to serve as the Conceptual Drainage Study.

***Newly Required Field**

****Review and concurrence of the Clark County Regional Flood Control District is required**

Local Entity File No.	Revision	Date

REFERENCE:

STANDARD FORM 1

Updated 05/01/2008



CITY OF LAS VEGAS

MINIMUM DRAINAGE STUDY CRITERIA STANDARD FORM 2 CHECKLIST SUPPLEMENT

(Revised 5/18/11)

The following checklist is intended as a supplemental guide for the engineer preparing a Technical Drainage Study submittal to the City of Las Vegas. This supplement focuses on requirements specific to the City of Las Vegas. The requirements presented are in addition to the Clark County Regional Flood Control District (CCRFCDD) Manual Standard Form 2. The listed items are the minimum information required prior to the City performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the CCRFCDD Hydrologic Criteria and Drainage Design Manual (Design Manual).

An appointment must be made to preview this checklist in conjunction with CCRFCDD Standard Form 2 prior to the City accepting a new drainage study for review. The engineer must contact the Flood Control Section at (702) 229-6541 to schedule a submittal appointment.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT		
Yes	No	
-	N/A	A notarized letter from the adjacent property owner(s) allowing off-site grading. (A copy of the letter must be received prior to final acceptance of the drainage study.)
-	X	Copies of all conditions of approval for development related to this property. (e.g. zoning, use permit, tentative map, etc.) Verify compliance with conditions.
X	-	An electronic copy of the complete submittal is required to be submitted with one original hard copy of the study. Electronic documents should be on a universal computer-readable digital output device replicating your submittal. An Indexed Portable Document Format (PDF) or Print Ready CAD file formats with a minimum of 300dpi are the desired formats. If figures are in color, they must be scanned in color and saved as a separate file.  by initial here, the engineer on record acknowledges that the electronic copy is an identical replicate of the original hard copy submitted to the City of Las Vegas.

II. GRADING PLAN INFORMATION		
Yes	No	
X	-	(1) 24" X 36" copy of the Grading Plan, (including all Detail Sheets) sealed by the engineer.
X	-	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street. Note: Proposed top of curb elevations must be provided for both sides of roadways even if only half street construction is required.
X	-	Label existing topography at a minimum 5 foot elevation interval including adjacent developments, finished floor elevations of existing buildings and top of existing curbs extending 100 feet around the perimeter of the site. (*Measured from the centerline of the adjacent roadway.)

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

II. GRADING PLAN INFORMATION		
Yes	No	
X	-	Proposed on-site and off-site storm drains and other flood control facilities with plan and profile sheets for public storm drains showing the class of pipe, (Class III, IV, V, etc.), design hydraulic grade line, (HGL) and 100 year storm flow. A public drainage easement must be provided over on-site storm drains conveying off-site flows. An overflow path must be provided over all storm drains.
-	N/A	All existing and "to be constructed" walls with cross-sections showing wall type, (e.g. block wall, retaining wall, flood wall, etc.), with limits clearly defined, adjacent ground elevations. Wall heights must meet current ordinances and in no case exceed 14 feet above the adjacent property.
X	-	Street slopes for both interior and perimeter streets. Note: The minimum slope for a roadway is 0.4 percent, a minimum 18-inch storm drain must be provided where minimum slopes cannot be met.
-	N/A	Back of lot elevations and lot drainage pattern for all lots including common lots.
-	N/A	Sites with a grade difference two feet above or below existing ground are required to have approval from City of Las Vegas Current Planning. Current Planning approval is required prior to final approval of the drainage study.
X	-	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners. (The project must pass flows through the site every 600 feet where the project is blocking flow paths.)
-	N/A	This project uses a solid grouted stem wall (or approved alternate) at the back of sidewalk to provide erosion protection for landscaped areas where the depth of flow in the roadway exceeds the back of walk elevation. A corresponding cross-section detail is included.
-	N/A	Commercial and Common Lot Landscape areas are not allowed to drain over the sidewalk. The grading plans show flow lines with grades and sidewalk under drains for all landscape areas draining to the public ROW.

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
-	N/A	Concrete valley gutters are required in parking lots with slopes less than 1 percent. Slopes through cul-de-sac must be at a 1 percent minimum where flow is drained through the cul-de-sac.
-	N/A	Ten-foot wide public drainage easements to be privately maintained are allowed for flow less than 20 cfs. The depth of flow entering the easement must be checked using the submerged weir calculation.
-	N/A	The limits of the flood zones and the base flood elevations (BFE) must be shown on all grading plans for all developments within a Special Flood Hazard Zone A, AO, AE, etc.
-	N/A	Minimum finish floor elevation is 6 inches above highest adjacent top of curb. Finish floor calculations must include allowances for super elevations on curves and velocity head for tee intersections.
-	N/A	Finished floor elevations for buildings adjacent to public drainage easements must be a minimum of 18 inches above the Q100 weir of submerged weir elevation, whichever is greater.

CITY OF LAS VEGAS MINIMUM DRAINAGE STUDY CRITERIA CHECKLIST

III. Local Entity Criteria - City of Las Vegas – Manual Section 1600		
Yes	No	
	N/A	Lots with "B and C Type Drainage" that drain from one lot to another through a drainage easement shall be required to install an underground nuisance drainage system or a 2-foot valley gutter. 16" x 24" minimum block wall openings are required for both options.
	N/A	Bubblers are required across 80 foot and greater ROW streets. When flows exceed 10 cfs, bubblers larger than 18 inches will be required up to a maximum of 36". Inlets must be sized to match the pipe size provided.

- Contact the Flood Control Section regarding the drainage study review fee. These fees are payable at the time of submittal.
- The Drainage Study must be conditionally approved prior to submitting improvement plans to the Civil and Planning Development of the Department of Building and Safety for review.

This document is intended as an **aid** in preparing Technical Drainage Studies for the City of Las Vegas. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all-inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

Project Name: Sunstone Phase 1a Infrastructure - Iron Mountain		Map ID:
Firm Name: Westwood Professional Services		Engineer: Amy Poechmann, P.E.
Address: 5725 Badura #100		
City: Las Vegas	State: NV	Zip: 89118
Phone Number: (702) 284-5300	Fax Number: (702) 284-5399	
Property Owner: SC East LandCo, LLC		
Address: 9275 W. Russell Road, Suite 400		
City: Las Vegas, NV	State: 89148	Zip:
Reviewed By:	Date Received:	Date Accepted for Review:

The following checklist is intended as a guide for the engineer preparing a Technical Drainage Study to submit to the local entity and Clark County Regional Flood Control District (if necessary). The listed items are the minimum information required prior to the entity performing a review. The engineer will remain responsible to ensure the Technical Drainage Study is prepared within the guidelines as set forth in the Clark County Regional Flood Control District (CCRFCD) Hydrologic Criteria and Drainage Design Manual (MANUAL).

This document is intended as an aid in preparing Technical Drainage Studies. Each study submitted is reviewed for compliance with local and regional criteria. This form is not intended to be all inclusive and does not limit the extent of the information, calculations or exhibits which may be necessary to properly evaluate the intended land use.

If items are not applicable for the subject site, provide N/A.

I. GENERAL REQUIREMENT

Yes	No	
<u>X</u>	<u>-</u>	Design Manual Standard Form 1 with the engineer's seal and signature.
<u>X</u>	<u>-</u>	Design Manual Standard Form 4 .
<u>X</u>	<u>-</u>	2 copies of the 24" x 36" Drainage Plan.
<u>-</u>	<u>-</u>	A notarized letter from the adjacent property owner(s) allowing off-site grading or discharge.

II. MAPS AND EXHIBITS

Yes	No	
<u>X</u>	<u>-</u>	A copy of a current Flood Insurance Rate Map (FIRM) with the site delineated.
<u>X</u>	<u>-</u>	A copy of the current CCRFCD Master Plan Update Figure, (F-x), for Flood Control Facilities and Environmental areas with the site delineated.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

II. MAPS AND EXHIBITS (Continued)

Yes	No	
<u>X</u>	<u>-</u>	Off-site drainage basin maps for existing, interim and future conditions showing the existing topography, basin boundaries, concentration points, and flows in cfs.
<u>X</u>	<u>-</u>	On-site drainage basin maps for existing and proposed conditions showing the existing topography, basin boundaries, concentration points, and on-site and off-site flows in cfs.
<u>X</u>	<u>-</u>	Vicinity Map with local and major cross streets identified and a north arrow.

III. DRAINAGE PLAN

Yes	No	
<u>X</u>	<u>-</u>	Sheet size: 24" x 36" sealed by a registered engineer in the State of Nevada.
<u>X</u>	<u>-</u>	Minimum scale: 1" = 60'.
<u>X</u>	<u>-</u>	Project name.
<u>X</u>	<u>-</u>	Vicinity Map with local and major cross streets.
<u>X</u>	<u>-</u>	Revision box.
<u>X</u>	<u>-</u>	North arrow and bar scale.
<u>X</u>	<u>-</u>	Engineer's/consultant's address and phone number.
<u>X</u>	<u>-</u>	Elevation datum and benchmark.
<u>X</u>	<u>-</u>	Legend for symbols and abbreviations.
<u>X</u>	<u>-</u>	Cut/fill scarps, where applicable.
<u>X</u>	<u>-</u>	Street names, grades, widths.
<u>X</u>	<u>-</u>	Proposed future and existing spot grades for top of curbs and street crowns at lot lines, grade breaks, and along curb returns on both sides of the street.
<u>X</u>	<u>-</u>	Existing contours encompassing the site and 100 feet beyond with spot elevations for important locations, where appropriate.
<u>-</u>	<u>N/A</u>	Minimum finish floor elevations with top-of-curb elevations at upstream end of lot.
<u>X</u>	<u>-</u>	Proposed typical street sections.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
<u>X</u>	<u>-</u>	Streets with off-set crowns.
<u>X</u>	<u>-</u>	Proposed contours or spot elevations in sufficient detail to exhibit intended drainage patterns and slopes.
<u>X</u>	<u>-</u>	Property lines.
<u>X</u>	<u>-</u>	Right-of-way lines and widths, existing and proposed.
<u>X</u>	<u>-</u>	Existing improvements and their elevations.
<u>X</u>	<u>-</u>	Delineation of proposed on-site drainage basins indicating area and 10-year and 100-year storm peak flows at basin concentration points.
<u>X</u>	<u>-</u>	Concentration points and drainage flow direction with Q_{100} and V_{100} and D_{100} in streets.
<u>X</u>	<u>-</u>	Cumulative flows, velocity, and direction of flow at upstream and downstream ends of site for the 10-year and 100-year flows.
<u>X</u>	<u>-</u>	Location and cross-section of street capacity calculations.
<u>X</u>	<u>-</u>	Cross-sectional detail for channels, including cutoff wall locations.
<u>X</u>	<u>-</u>	Existing and proposed drainage facilities, appurtenances, and connections (i.e., sidewalk, ditches, swales, storm drain systems, unimproved and improved channels, and culverts, etc.) stating size, material, shape, and slope with plan and profile and HGL calculations.
<u>X</u>	<u>-</u>	Existing and proposed drainage easements and widths shown with sufficient detail. A cross sectional detail must be provided that shows appropriate lining and reinforcement.
<u>-</u>	<u>N/A</u>	Location and detail of existing, proposed, and future block wall openings. Minimum size is 16" x 48". Wrought iron gate is required for flows > 10 cfs.
<u>-</u>	<u>N/A</u>	Location and detail of flood walls illustrating depth of flow, proposed grouting height, etc.
<u>-</u>	<u>N/A</u>	Perimeter retaining wall locations. All existing and proposed walls (retaining screen and flood) must be shown with adjacent ground elevations. Flood walls with 8-inch concrete masonry unit.
<u>-</u>	<u>N/A</u>	Building and/or lot numbers.
<u>-</u>	<u>N/A</u>	Alignment of all existing, proposed, or future Regional Facilities adjacent to the site.
<u>-</u>	<u>N/A</u>	Limits of existing floodplain based on current FIRM or best available information; limits of proposed floodplains based on best available information.

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

III. DRAINAGE PLAN (Continued)

Yes	No	
☐	☐ N/A	For areas in Zone A, AE, AH, and AO, base flood elevations (BFEs) must be shown for each lot; BFEs may be listed on each lot, or in a table. Finish floor elevations must be a minimum of 18 inches above BFE.
☐	☐ N/A	Appropriately elevated "humps" 6 inches above the 100 year water surface elevation at site accesses where the intent is to protect the site from the Q ₁₀₀ flows.
☒	☐	Street slopes for perimeter and interior streets. The minimum slope is 0.4 percent.
☐	☐ N/A	Location and detail of best management practice (BMP) for parking lots and low impact development (LID) (if required).

IV. HYDROLOGIC ANALYSIS

Yes	No	
☒	☐	Appropriate soil information and Soils Map for existing and future conditions with subbasins and property delineated.
☒	☐	Input and output information for existing conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	Input and output information for future conditions from computer models (HEC-1 or TR-55). The flow routing diagram must be provided with HEC-1 models.
☒	☐	Use of correct precipitation values in and around the McCarran Airport rainfall area.
☒	☐	A discussion in the text of the hydrologic analysis justifying subbasin boundaries and cutoffs, supporting assumptions, and calculations.
☒	☐	A summary table of stormwater flows showing basin area, Q ₁₀ and Q ₁₀₀ for both individual basins and combined basin flows, where applicable.
☒	☐	Copies of supporting technical information referenced from a previously approved study and a statement accepting these results.
☒	☐	On-site facilities must perpetuate flows through or around the site without significantly impacting adjacent property owners in accordance with current Nevada Drainage Law.
☐	☐ N/A	Calculation for impervious area for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2

HYDROLOGIC CRITERIA AND DRAINAGE DESIGN MANUAL

DRAINAGE SUBMITTAL CHECKLIST

V. HYDRAULIC ANALYSIS

Yes	No	
<u>-</u>	<u>N/A</u>	Flow split calculations and supporting documentation or reference for the method of flow split calculations used.
<u>X</u>	<u>-</u>	Normal depth street flow calculations and cross section diagrams for all interior and perimeter streets. Provide "d x v" products for the Q_{100} and Q_{10} flows representing the worst case for interior and all perimeter streets. $Q_{100} d \times v \leq 8$. $Q_{10} d \times v \leq 6$ and 12 foot dry lane for rights-of-way ≥ 80 feet. Calculations must be labeled by street name as indicated on the Grading Plan.
<u>X</u>	<u>-</u>	A summary table of interior and exterior street capacity calculations showing the street name, Q_{100} flow, slope, depth of flow, velocity and depth times velocity product and streets needing to meet 12 foot dry lane criteria.
<u>-</u>	<u>N/A</u>	Appropriate hydraulic calculations for block wall openings assuming a 50 percent vertical clogging factor. (Assume the lower half of the opening is plugged.)
<u>-</u>	<u>N/A</u>	Appropriate hydraulic calculations at drainage easement entrance and discharge locations to set finish floor elevations. Hydraulic calculations must include submerged weir, superelevation and tee intersection losses, where appropriate.
<u>-</u>	<u>N/A</u>	Provide necessary freeboard requirements to set the finished floor elevations of all proposed buildings, 2 x depth of flow or depth of flow plus 18 inches of freeboard, whichever is less. The minimum requirement is 6 inches above adjacent upstream top of curb. Buildings adjacent to drainage easements must always be provided with 18 inches of freeboard above the Q_{100} weir height or flow depth, whichever is greater.
<u>-</u>	<u>N/A</u>	A complete water surface profile analysis (HEC-2, HEC-RAS, etc.) for channel flows and FEMA Zone A flood zones. • Field survey data. • Input and output information. • Plotted cross-sections based on survey with proper encroachments. • A map showing the location of the cross-sections. • Analysis of both sub and super-critical flow segments. • A summary table and a discussion of the results in the text of the report.
<u>-</u>	<u>N/A</u>	Provide a 50 percent clogging factor in the capacity calculation for drop inlets.
<u>X</u>	<u>-</u>	Hydraulic calculations for culverts and storm drains. D-Load calculations must be provided for storm drain pipes in public rights-of-way, including headwater pool inundation.
<u>X</u>	<u>-</u>	The mitigation of nuisance water, both during construction and in the fully developed condition, must be addressed.
<u>-</u>	<u>N/A</u>	Provide BMP type, size and supporting calculations for parking lots and LIDs (if required).

REFERENCE:

STANDARD FORM 2

EST1911.000

November 2, 2021

Jennifer Shinn, P.E.
Flood Control, Engr. Associate
City of Las Vegas
495 S. Main Street
1st Floor
Las Vegas, Nevada 89101

**Subject: Technical Drainage Study Update No. 2 for
Sunstone Phase 1A Infrastructure (Iron Mountain Road to Tee Pee Lane)
(TDS CLV DS5199)**

Dear Ms. Shinn,

Submitted for your review is this Technical Drainage Study Update No. 2 for the subject project. The original Technical Drainage Study (TDS) was approved by City of Las Vegas (CLV) in March 2020 and Update No. 1 was approved in August 2021. Refer to Appendix A for a copy of the latest approval letter.

Purpose: This Update has been prepared to support the modifications to the storm drain mainline in Iron Mountain Road. The existing utilities were potholed and based on the as-built information SDMH#1 was shifted slightly east (downstream).

Storm Drain Analysis: The storm drain mainline has been revised and modeled with the minor changes to the lengths and inverts around SDMH#1. The updated WSPG model has been provided in Appendix B.

Conclusions: The provided hydraulic analysis shows that the updates to the proposed storm drain are in compliance with CCRFCD Manual criteria and show no adverse impacts. The improvement plans included in the last appendix supports the conclusions and recommendations detailed in this Update. If you have any questions or require additional information, please do not hesitate to contact us at (702) 284-5300.

Respectfully Submitted,
WESTWOOD PROFESSIONAL SERVICES


Amy Poehmann, P.E.
Project Manager
Water Resources Department

Pc: Mark Failla, P.E., CFM
Josh Johnson, P.E., WPS

List of Appendices

Appendix A	Reference Material Technical Drainage Study for Sunstone Phase 1A Infrastructure (Iron Mountain Road to Tee Pee Lane) (DS5199) • Approval Letter • Referenced Storm Drain Computations • Referenced Plan Sheets
Appendix B	Storm Drain Computations • Main WSPGW Model
Appendix C	Improvement Plans

EST1911.000

November 2, 2021

Jennifer Shinn, P.E.
Flood Control, Engr. Associate
City of Las Vegas
495 S. Main Street
1st Floor
Las Vegas, Nevada 89101

**Subject: Technical Drainage Study Update No. 2 for
Sunstone Phase 1A Infrastructure (Iron Mountain Road to Tee Pee Lane)**

Ms. Shinn:

This letter certifies that all items provided on electronic submittal CD matches 100% of the *Technical Drainage Study Update for Sunstone Phase 1A Infrastructure (Iron Mountain Road to Tee Pee Lane)* bound paper version.

Respectfully Submitted,
WESTWOOD PROFESSIONAL SERVICES



Amy Poechmann, P.E.
Project Manager – Water Resources Department

APPENDIX A

Reference Material

**Technical Drainage Study for
Sunstone Phase 1A Infrastructure
(Iron Mountain Road to Tee Pee Lane)
(DS5199)**

Approval Letter

CITY OF LAS VEGAS			DATE:
INTER-OFFICE MEMORANDUM			August 17, 2021
TO: Land Development Services Department of Public Works			FROM: Jennifer Shinn, P.E. Flood Control, Engr. Associate Department of Public Works
SUBJECT:	Drainage Study for:		COPIES TO:
	SUNSTONE - Phase 1A Infrastructure		Slater Hanifan Group
Cross Streets:	Iron Mountain Road & Tee Pee Lane		Eastland Co., LLC
File Number:	F:\PW Flood\DSMEMOS\DS5199C.docx		Bart Anderson, P.E., DevCo
Parcel Number:	125-06-501-001, 125-06-701-001, 125-07-501-005		CCRFCD NDOT
Zoning Action:	Eastland Development Agreement		
FEMA Flood Zone	YES	NO	X
Proposed Storm Drain	YES	X	NO

HISTORY	DATE RECEIVED	DATE REVIEWED	COMMENTS	REVIEW FEES	FEES PAID Transaction #
1 st Submittal	10/3/2019	11/27/2019	See Comments Below	\$400.00	3596425: \$400
2 nd Submittal	2/17/2020	3/18/2020		\$400.00	3744731: \$400
3 rd Submittal	7/19/2021	8/16/2021	Approved	\$100.00	4379910: \$100
TOTAL FEES (LDDRS):				\$900.00	----

REMARKS:

3rd Submittal: Update #1 to extend the Iron Mountain storm drain west to US-95 and north within Sky Pointe Drive.

SUNSTONE – Phase 1A Infrastructure Improvements as well as the Master Study (DS5081) are predicated upon the completion of the ultimate condition offsite drainage facilities impacting the SUNSTONE development being in place prior to issuance of certificates of occupancy. Permits for development within Designated Builder Parcels shall not be issued if the associated Master Plan facilities are not under construction.

The Master Drainage Study for the subject project has been reviewed and:

X	is approved subject to conformance to all City standards and the following conditions:
	must be resubmitted or supplemented including the following:
	is conditionally approved subject to Clark County Regional Flood Control District concurrence.
	is conditionally approved subject to Nevada Department of Transportation concurrence.

The SUNSTONE – Phase 1A Infrastructure includes storm drain facilities that are sized based upon the design parameter of US-95 being a flow cut-off. **This Study assumes ultimate condition offsite drainage facilities impacting the SUNSTONE development will be in place prior to issuance of certificates of occupancy.** The ultimate condition infrastructure drainage facilities that are assumed to be in place include:

- The Moccasin Master Plan Regional Facility – Upper Las Vegas Wash to west of US-95. This includes the Interim Collection Facility west of US-95.

- Skye Canyon Detention Basin #2.
- Skye Canyon Phase 3A regional Facility – Skye Canyon Park Dr. to Iron Mountain Rd.
- The US-95 Local Facility – Brent Lane to Kyle Canyon Interchange. This connects into the existing MPU Facility along US-95.

The construction of these Ultimate Facilities will make the west side of US 95 a 100-yr cutoff through the reach south of the Moccasin Master Plan Regional Facility crossing, thereby meeting the full intent of the CCRFCD Master Plan.

Changes and timing of the corresponding infrastructure improvements that protect the SUNSTONE Development shall require Updating the Master Drainage Study Phasing.

1. The SUNSTONE - Phase 1A Infrastructure Improvements include the following roadways:
 - Iron Mountain Road – Skye Canyon Park Drive to Tee Pee Lane
 - Tee Pee Lane – Iron Mountain Road to Brent Lane
2. The Storm Drain System design includes lateral stubs at most Designated Builder Parcels that will convey the 100-year Ultimate flows from each parcel. Technical Drainage Studies are required for each of the Designated Builder Parcels and shall provide on-site collection for the 100-year facilities
3. Structural plans for the storm drain improvements including special junction structures and modified manholes and drop inlets must be submitted for review. Provide a soils report, structural calculations and specifications, two wet stamped structural sets, and a grading plan to the Building Department for processing. The engineer must provide a copy of Building Department approval of the structures to *Flood Control* prior to final acceptance of the drainage study.
4. Technical drainage studies are required for each of the Designated Builder Parcels. The technical drainage studies for the Designated Builder Parcels shall not be submitted until the conditional approval of the pertinent infrastructure drainage study is obtained. Final approval for the infrastructure drainage study shall be obtained prior to conditional approval of the impacted Builder Parcels drainage studies.
5. Building permits for the homes within the individual Designated Builder Parcels shall not be issued until construction of the street and flood control infrastructure around the Designated Builder Parcels is substantially complete or interim protection is provided per the approved technical drainage study.
6. The interim drainage channels and sumps adjacent to the infrastructure roadways are the Maintenance responsibility of the Master Developer.
7. The project proposes to build temporary drainage facilities including drainage berms/swales over the *Phase 1A Infrastructure* site. Interim drainage facilities are normally shown on the Improvement Plans, bonded for construction, and bonded under a separate Maintenance Agreement. As an alternative to including interim drainage improvements that are privately maintained as a part of the *Phase 1A Infrastructure*, and prior to the final plan approval for each set of improvement plans that will be bonded separately, the Improvement Plans shall show concrete pads and rip-rap berms at the culvert stubs for interim flows, and the developer must complete a ***Maintenance and Liability Agreement*** and bond for 100% of the costs. The Maintenance Bond shall include exhibits showing the interim drainage improvements at each culvert and the associated costs to complete the improvements. This shall be in the form of a 50% cash bond and a 50% standard bond for Maintenance. The cash bond gives the City the ability to perform work and draw down funds as needed in the interim condition. The engineer must submit an estimate of the quantities for the construction of the facilities and an exhibit that adequately shows the location and limits of the drainage facilities to *City Flood Control* for approval. Once the drainage study is conditionally approved, the engineer/developer should contact the *City's Land Development Section* (702-229-6371) to begin the agreement process.

In order for the maintenance bond to be released in the future, a drainage update/letter will be required to justify that the berms/swales are no longer necessary and can be removed.

A. Iron Mountain Road Improvement Plans:

OS-1: Provide fencing around the headwall at the storm drain system head works at the north end of the subject site.

DT-1: Call out Type II for 12' storm drain access road shown in Detail E.

NOTE: Any future changes to the proposed design (or design assumptions) as outlined in the approved drainage study and attached preliminary grading plan which affect drainage must be addressed in a Drainage Study Update and accepted by the *City of Las Vegas Flood Control Section*. Additionally, conditional acceptance of a drainage study is valid for a period of one (1) year. If the proposed construction has not been completed in that time period, the *City of Las Vegas* reserves the right to require additional conditions and/or submission and acceptance of a complete drainage study update prior to further construction of a project.

NOTE: Please be advised that all land surface area disturbances over 1 acre or any area adjacent to a water way must submit to the Nevada Division of Environmental Protection a "Notice of Intent" to discharge that certifies a stormwater pollution prevention plan has been developed and is maintained on site; for inclusion in the Stormwater General Permit No. NVR100000. A phased construction unit in a contiguous subdivision is considered under construction until all stripped or disturbed surface areas have been covered by paving, building construction or planting. For more information, including forms and applications see <http://ndep.nv.gov/bwpc/storm01.htm> or call (775) 687-9429.

END OF REMARKS

JKS/PBJ

T/R/S: T19S/R60E/6 & 7

AREA G-6 & 7

Referenced WSPG Model

T1 EST1911: SUNSTONE IM & TP
T2 MAINLINE (MAIN)

18 PROPOSED DRAINAGE CONDITION									
SO	1000.0002704.970	30						2706.970	
R	1108.9502706.060	30	.013						0.0
WE	1108.9502706.060	1							
R	1109.9502706.070	1	.015						0.0
JX	1110.9502706.080	1	1	.015			2706.080		90.0
R	1112.9502706.160	1	.015						0.0
WX	1112.9502706.160	30							
R	1501.6802721.730	30	.013						0.0
R	1892.4102733.850	30	.013						0.0
R	2281.8702745.128	30	.013						6.0
JX	2284.3702745.200	30	24	.013	14.0		2745.700		37.0
R	2456.5602749.517	30	.013						12.0
R	2457.3932749.538	30	.013						12.0
R	2458.2272749.559	30	.013						11.0
R	2459.0602749.580	30	.013						11.0
R	2625.1502754.280	30	.013						5.0
R	2875.1502758.640	30	.013						4.0
R	3045.1502761.030	30	.013						5.0
R	3196.6202762.958	30	.013						5.0
R	3197.8702762.974	30	.013						15.0
R	3199.1202762.990	30	.013						15.0
R	3229.3102763.140	30	.013						15.0
SH	3229.3102763.140	30							
CD	24	4	1	0.000	2.000				
CD	30	4	1	0.000	2.500				
CD	1	3	0	0.000	5.000				
Q					25.000				

WSPG MODEL HAS BEEN REVISED

W S P G W - EDIT LISTING - Version 14.10
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD	SECT	CHN	NO OF	AVE	PIER	HEIGHT	1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIER/PIP	WIDTH	DIAMETER	WIDTH	DROP														

CD	24	4	1		2.000																
CD	30	4	1		2.500																
CD	1	3	0	.000	5.000	3.500	.000	.000	.000	.000	.00										

PAGE NO 1

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS - EST1911: SUNSTONE IM & TP

HEADING LINE NO 2 IS - MAINLINE (MAIN)

HEADING LINE NO 3 IS - PROPOSED DRAINAGE CONDITION

W S P G W
 WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1	IS	A	SYSTEM	OUTLET	STATION	INVERT	SECT													

ELEMENT NO	2	IS	A	REACH		1000.000	2704.970	30													

ELEMENT NO	3	IS	A	WALL	ENTRANCE	1108.950	2706.060	30													

ELEMENT NO	4	IS	A	REACH		1108.950	2706.060	1													

ELEMENT NO	5	IS	A	JUNCTION		1109.950	2706.070	1													

ELEMENT NO	6	IS	A	REACH		1110.950	2706.080	1													

ELEMENT NO	7	IS	A	WALL	EXIT	1112.950	2706.160	1													

ELEMENT NO	8	IS	A	REACH		1112.950	2706.160	30													

ELEMENT NO	9	IS	A	REACH		1501.680	2721.730	30													

ELEMENT NO	10	IS	A	REACH		1892.410	2733.850	30													

Page 1

U/S DATA		STATION	INVERT	SECT	MAIN. EDT		RADIUS		ANGLE	ANG PT	MAN H	
ELEMENT NO	11 IS A JUNCTION	2281.870	2745.128	30	N	.013	*	.000	.000	6.000	1	
U/S DATA		STATION	INVERT	SECT	LAT-1	LAT-2	Q3	Q4	INVERT-3	INVERT-4	PHI 3	PHI 4
		2284.370	2745.200	30	24	0	.013	.000	2745.700	.000	37.000	.000
									RADIUS	ANGLE		
									.000	.000		
W S P G W												
WATER SURFACE PROFILE - ELEMENT CARD LISTING												
ELEMENT NO	12 IS A REACH	STATION	INVERT	SECT	N						PAGE NO	3
U/S DATA		2456.560	2749.517	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	13 IS A REACH	STATION	INVERT	SECT	N				.000	.000	12.000	1
U/S DATA		2457.393	2749.538	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	14 IS A REACH	STATION	INVERT	SECT	N				.000	.000	12.000	0
U/S DATA		2458.227	2749.559	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	15 IS A REACH	STATION	INVERT	SECT	N				.000	.000	11.000	0
U/S DATA		2459.060	2749.580	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	16 IS A REACH	STATION	INVERT	SECT	N				.000	.000	11.000	0
U/S DATA		2625.150	2754.280	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	17 IS A REACH	STATION	INVERT	SECT	N				.000	.000	5.000	1
U/S DATA		2875.150	2758.640	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	18 IS A REACH	STATION	INVERT	SECT	N				.000	.000	4.000	1
U/S DATA		3045.150	2761.030	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	19 IS A REACH	STATION	INVERT	SECT	N				.000	.000	5.000	1
U/S DATA		3196.620	2762.958	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	20 IS A REACH	STATION	INVERT	SECT	N				.000	.000	15.000	1
U/S DATA		3197.870	2762.974	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	21 IS A REACH	STATION	INVERT	SECT	N				.000	.000	15.000	0
U/S DATA		3199.120	2762.990	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	22 IS A REACH	STATION	INVERT	SECT	N				.000	.000	15.000	0
U/S DATA		3229.310	2763.140	30	N	.013			RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	23 IS A SYSTEM HEADWORKS	STATION	INVERT	SECT	N				.000	.000	.000	0
U/S DATA		3229.310	2763.140	30	N	.013	*		RADIUS	ANGLE	ANG PT	MAN H
W S ELEV												
.000												

EST1911: SUNSTONE IM & TP
MAINLINE (MAIN)

Date: 7-13-2021 Time:12:50:51

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
1000.000	2704.970	1.951	2706.921	39.10	9.51	1.41	2708.33	.00	2.11	2.07	2.500	.000	.00	1 .0
25.499	.0100					.0100	.26	1.95	1.19	1.95	.013	.00	.00	PIPE
1025.499	2705.225	1.951	2707.176	39.10	9.51	1.41	2708.58	.00	2.11	2.07	2.500	.000	.00	1 .0
68.014	.0100					.0098	.66	1.95	1.19	1.95	.013	.00	.00	PIPE
1093.513	2705.906	2.001	2707.906	39.10	9.29	1.34	2709.24	.00	2.11	2.00	2.500	.000	.00	1 .0
15.437	.0100					.0091	.14	2.00	1.13	1.95	.013	.00	.00	PIPE
1108.950	2706.060	2.109	2708.169	39.10	8.85	1.22	2709.39	.00	2.11	1.82	2.500	.000	.00	1 .0
WALL ENTRANCE														
1108.950	2706.060	4.082	2710.142	39.10	2.74	.12	2710.26	.00	1.57	3.50	5.000	3.500	.00	0 .0
1.000	.0100					.0006	.00	4.08	.24	1.35	.015	.00	.00	BOX
1109.950	2706.070	4.072	2710.142	39.10	2.74	.12	2710.26	.00	1.57	3.50	5.000	3.500	.00	0 .0
JUNCT STR	.0100					.0006	.00	4.07	.24		.015	.00	.00	BOX
1110.950	2706.080	4.063	2710.144	39.00	2.74	.12	2710.26	.00	1.57	3.50	5.000	3.500	.00	0 .0
2.000	.0399					.0006	.00	4.06	.24	.83	.015	.00	.00	BOX
1112.950	2706.160	3.980	2710.140	39.00	2.80	.12	2710.26	.00	1.57	3.50	5.000	3.500	.00	0 .0
WALL EXIT														
1112.950	2706.160	3.981	2710.140	39.00	7.95	.98	2711.12	.00	2.11	.00	2.500	.000	.00	1 .0
11.984	.0401					.0090	.11	3.98	.00	1.21	.013	.00	.00	PIPE

WATER SURFACE PROFILE LISTING

Date: 7-13-2021 Time:12:50:51

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.	Height/ I.D.	Base Wt	ZL	No With Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1124.934	2706.640	3.609	2710.249	39.00	7.95	.98	2711.23	.00	2.11	.00	2.500	.000	.00	1	.0
HYDRAULIC JUMP															
1124.934	2706.640	1.213	2707.853	39.00	16.51	4.23	2712.09	.00	2.11	2.50	2.500	.000	.00	1	.0
54.084	.0401					.0401	2.17	1.21	2.99	1.21	.013	.00	.00	PIPE	
1179.018	2708.806	1.213	2710.019	39.00	16.51	4.23	2714.25	.00	2.11	2.50	2.500	.000	.00	1	.0
141.980	.0401					.0400	5.68	1.21	2.99	1.21	.013	.00	.00	PIPE	
1320.998	2714.493	1.214	2715.707	39.00	16.50	4.23	2719.93	.00	2.11	2.50	2.500	.000	.00	1	.0
137.353	.0401					.0376	5.16	1.21	2.99	1.21	.013	.00	.00	PIPE	
1458.351	2719.994	1.260	2721.254	39.00	15.73	3.84	2725.10	.00	2.11	2.50	2.500	.000	.00	1	.0
43.329	.0401					.0331	1.43	1.26	2.78	1.21	.013	.00	.00	PIPE	
1501.680	2721.730	1.308	2723.038	39.00	15.00	3.49	2726.53	.00	2.11	2.50	2.500	.000	.00	1	.0
245.368	.0310					.0310	7.61	1.31	2.59	1.31	.013	.00	.00	PIPE	
1747.048	2729.341	1.308	2730.649	39.00	15.00	3.49	2734.14	.00	2.11	2.50	2.500	.000	.00	1	.0
145.362	.0310					.0300	4.36	1.31	2.59	1.31	.013	.00	.00	PIPE	
1892.410	2733.850	1.336	2735.186	39.00	14.61	3.32	2738.50	.00	2.11	2.49	2.500	.000	.00	1	.0
85.135	.0290					.0290	2.47	1.34	2.49	1.34	.013	.00	.00	PIPE	
1977.546	2736.315	1.336	2737.651	39.00	14.61	3.32	2740.97	.00	2.11	2.49	2.500	.000	.00	1	.0
146.109	.0290					.0280	4.09	1.34	2.49	1.34	.013	.00	.00	PIPE	

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.-FT	Height/ I.D.	Base Wt	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
2123.655	2740.546	1.364	2741.910	39.00	14.24	3.15	2745.06	.00	2.11	2.49	2.500	.000	.00	1 .0
66.286	.0290	- -	- -	- -	- -	.0255	1.69	1.36	2.39	1.34	.013	.00	.00	PIPE
2189.941	2742.466	1.418	2743.884	39.00	13.57	2.86	2746.74	.00	2.11	2.48	2.500	.000	.00	1 .0
31.419	.0290	- -	- -	- -	- -	.0225	.71	1.42	2.22	1.34	.013	.00	.00	PIPE
2221.360	2743.376	1.475	2744.851	39.00	12.94	2.60	2747.45	.00	2.11	2.46	2.500	.000	.00	1 .0
19.449	.0290	- -	- -	- -	- -	.0199	.39	1.47	2.06	1.34	.013	.00	.00	PIPE
2240.809	2743.939	1.535	2745.474	39.00	12.34	2.36	2747.84	.00	2.11	2.43	2.500	.000	.00	1 .0
13.332	.0290	- -	- -	- -	- -	.0176	.23	1.53	1.91	1.34	.013	.00	.00	PIPE
2254.142	2744.325	1.599	2745.924	39.00	11.77	2.15	2748.07	.00	2.11	2.40	2.500	.000	.00	1 .0
9.572	.0290	- -	- -	- -	- -	.0156	.15	1.60	1.76	1.34	.013	.00	.00	PIPE
2263.714	2744.602	1.667	2746.269	39.00	11.22	1.95	2748.22	.00	2.11	2.36	2.500	.000	.00	1 .0
6.960	.0290	- -	- -	- -	- -	.0139	.10	1.67	1.63	1.34	.013	.00	.00	PIPE
2270.674	2744.804	1.740	2746.543	39.00	10.70	1.78	2748.32	.00	2.11	2.30	2.500	.000	.00	1 .0
5.008	.0290	- -	- -	- -	- -	.0124	.06	1.74	1.50	1.34	.013	.00	.00	PIPE
2275.682	2744.949	1.818	2746.767	39.00	10.20	1.62	2748.38	.00	2.11	2.23	2.500	.000	.00	1 .0
3.429	.0290	- -	- -	- -	- -	.0111	.04	1.82	1.37	1.34	.013	.00	.00	PIPE
2279.110	2745.048	1.904	2746.952	39.00	9.72	1.47	2748.42	.00	2.11	2.13	2.500	.000	.00	1 .0
2.049	.0290	- -	- -	- -	- -	.0100	.02	1.90	1.25	1.34	.013	.00	.00	PIPE

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.	Height/FT or I.D.	Base Wt	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
2281.160	2745.107	1.998	2747.106	39.00	9.27	1.33	2748.44	.00	2.11	2.00	2.500	.000	.00	1	.0
.710	.0290					.0091	.01	2.00	1.13	1.34	.013	.00	.00	PIPE	
2281.870	2745.128	2.107	2747.234	39.00	8.84	1.21	2748.45	.00	2.11	1.82	2.500	.000	.00	1	.0
JUNCT STR	.0288					.0062	.02	2.11	1.00		.013	.00	.00	PIPE	
2284.370	2745.200	3.166	2748.365	25.00	5.09	.40	2748.77	.00	1.70	.00	2.500	.000	.00	1	.0
27.908	.0251					.0037	.10	3.17	.00	1.08	.013	.00	.00	PIPE	
2312.278	2745.900	2.587	2748.487	25.00	5.09	.40	2748.89	.00	1.70	.00	2.500	.000	.00	1	.0
HYDRAULIC JUMP															
2312.278	2745.900	1.076	2746.976	25.00	12.37	2.38	2749.35	.00	1.70	2.48	2.500	.000	.00	1	.0
29.331	.0251					.0251	.74	1.08	2.41	1.08	.013	.00	.00	PIPE	
2341.629	2746.635	1.076	2747.712	25.00	12.37	2.38	2750.09	.00	1.70	2.48	2.500	.000	.00	1	.0
114.931	.0251					.0264	3.03	1.08	2.41	1.08	.013	.00	.00	PIPE	
2456.560	2749.517	1.046	2750.563	25.00	12.84	2.56	2753.12	.00	1.70	2.47	2.500	.000	.00	1	.0
.833	.0252					.0278	.02	1.05	2.55	1.07	.013	.00	.00	PIPE	
2457.393	2749.538	1.046	2750.584	25.00	12.85	2.56	2753.15	.00	1.70	2.47	2.500	.000	.00	1	.0
.834	.0252					.0278	.02	1.05	2.55	1.07	.013	.00	.00	PIPE	
2458.227	2749.559	1.045	2750.604	25.00	12.86	2.57	2753.17	.00	1.70	2.47	2.500	.000	.00	1	.0
.833	.0252					.0279	.02	1.05	2.55	1.07	.013	.00	.00	PIPE	

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

*****														No Wth
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Height/ Base Wt	ZL	Prs/Pip	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
2459.060	2749.580	1.045	2750.625	25.00	12.86	2.57	2753.19	.00	1.70	2.47	2.500	.000	.00	1 .0
86.417	.0283					.0268	2.32	1.04	2.55	1.04	.013	.00	.00	PIPE
2545.477	2752.026	1.069	2753.095	25.00	12.48	2.42	2755.51	.00	1.70	2.47	2.500	.000	.00	1 .0
43.046	.0283					.0241	1.04	1.07	2.44	1.04	.013	.00	.00	PIPE
2588.522	2753.244	1.109	2754.352	25.00	11.90	2.20	2756.55	.00	1.70	2.48	2.500	.000	.00	1 .0
22.305	.0283					.0212	.47	1.11	2.28	1.04	.013	.00	.00	PIPE
2610.828	2753.875	1.150	2755.025	25.00	11.34	2.00	2757.02	.00	1.70	2.49	2.500	.000	.00	1 .0
14.322	.0283					.0186	.27	1.15	2.13	1.04	.013	.00	.00	PIPE
2625.150	2754.280	1.193	2755.473	25.00	10.81	1.82	2757.29	.00	1.70	2.50	2.500	.000	.00	1 .0
90.448	.0174					.0174	1.58	1.19	1.98	1.19	.013	.00	.00	PIPE
2715.598	2755.857	1.193	2757.050	25.00	10.81	1.82	2758.87	.00	1.70	2.50	2.500	.000	.00	1 .0
115.115	.0174					.0167	1.92	1.19	1.98	1.19	.013	.00	.00	PIPE
2830.713	2757.865	1.224	2759.089	25.00	10.46	1.70	2760.79	.00	1.70	2.50	2.500	.000	.00	1 .0
44.437	.0174					.0150	.67	1.22	1.89	1.19	.013	.00	.00	PIPE
2875.150	2758.640	1.271	2759.910	25.00	9.98	1.55	2761.46	.00	1.70	2.50	2.500	.000	.00	1 .0
59.935	.0141					.0141	.84	1.27	1.76	1.27	.013	.00	.00	PIPE
2935.085	2759.483	1.271	2760.753	25.00	9.98	1.55	2762.30	.00	1.70	2.50	2.500	.000	.00	1 .0
110.065	.0141					.0133	1.47	1.27	1.76	1.27	.013	.00	.00	PIPE

EST1911: SUNSTONE IM & TP
WATER SURFACE PROFILE LISTING

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/Dia.-FT	Base Wt or I.D.	No Wth Prs/Pip	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3045.150	2761.030	1.312	2762.343	25.00	9.58	1.42	2763.77	.00	1.70	2.50	2.500	.000	.00	1 .0
92.221	.0127					.0119	1.10	1.31	1.65	1.31	.013	.00	.00	PIPE
3137.371	2762.204	1.359	2763.563	25.00	9.17	1.31	2764.87	.00	1.70	2.49	2.500	.000	.00	1 .0
30.587	.0127					.0106	.32	1.36	1.54	1.31	.013	.00	.00	PIPE
3167.958	2762.593	1.412	2764.005	25.00	8.74	1.19	2765.19	.00	1.70	2.48	2.500	.000	.00	1 .0
15.267	.0127					.0094	.14	1.41	1.43	1.31	.013	.00	.00	PIPE
3183.225	2762.788	1.469	2764.256	25.00	8.34	1.08	2765.34	.00	1.70	2.46	2.500	.000	.00	1 .0
8.611	.0127					.0083	.07	1.47	1.33	1.31	.013	.00	.00	PIPE
3191.836	2762.897	1.529	2764.426	25.00	7.95	.98	2765.41	.00	1.70	2.44	2.500	.000	.00	1 .0
4.784	.0127					.0073	.04	1.53	1.23	1.31	.013	.00	.00	PIPE
3196.620	2762.958	1.592	2764.550	25.00	7.58	.89	2765.44	.00	1.70	2.40	2.500	.000	.00	1 .0
1.250	.0129					.0067	.01	1.59	1.14	1.30	.013	.00	.00	PIPE
3197.870	2762.974	1.622	2764.596	25.00	7.42	.85	2765.45	.00	1.70	2.39	2.500	.000	.00	1 .0
.323	.0127					.0065	.00	1.62	1.10	1.31	.013	.00	.00	PIPE
3198.193	2762.978	1.632	2764.610	25.00	7.36	.84	2765.45	.00	1.70	2.38	2.500	.000	.00	1 .0
.927	.0127					.0061	.01	1.63	1.09	1.31	.013	.00	.00	PIPE
3199.120	2762.990	1.704	2764.694	25.00	7.02	.76	2765.46	.00	1.70	2.33	2.500	.000	.00	1 .0
14.491	.0050					.0054	.08	1.70	1.00	1.80	.013	.00	.00	PIPE

Page 6

Date: 7-13-2021 Time:12:50:51

WATER SURFACE PROFILE LISTING

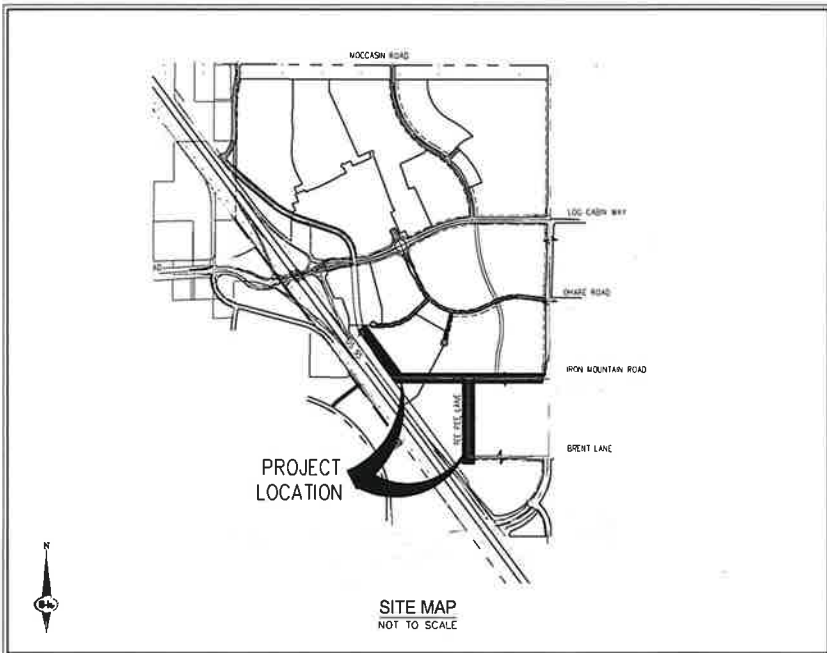
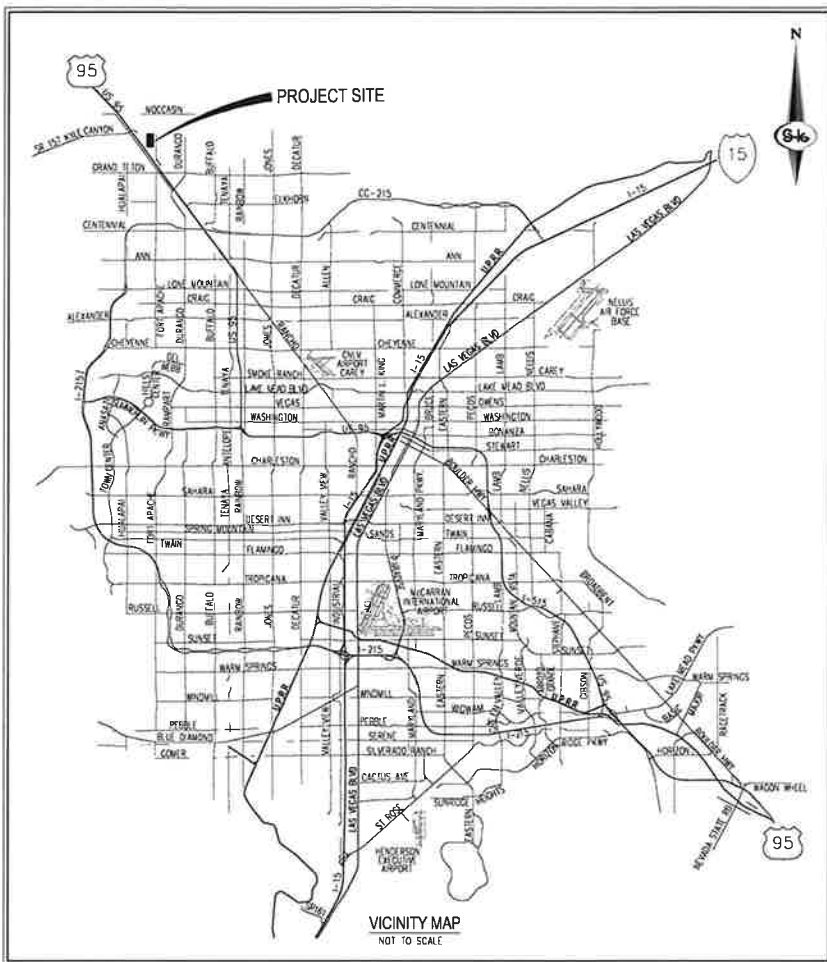
EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

*****																	*****																
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.-FT	Height/ or I.D.	Base Wt	ZL	No Wth Prs/Pip											ZR	Type Ch						
L/Elem	*****	*****	*****	*****	*****	SF Ave	HF	SE	Dpth	Froude N	Norm Dp	"N"	X-Fall	*****	*****	*****											*****	*****					
3213.611	2763.062	1.779	2764.841	25.00	6.69	.70	2765.54	.00	1.70	2.26	2.500	.000	.00	1	.0																		
15.699	.0050					.0050	.08	1.78	.92	1.80	.013	.00	.00	PIPE																			
3229.310	2763.140	1.787	2764.927	25.00	6.66	.69	2765.62	.00	1.70	2.26	2.500	.000	.00	1	.0																		

Referenced Improvement Plans



IMPROVEMENT PLANS FOR SUNSTONE PHASE 1 IRON MOUNTAIN ROAD AND TEE PEE LANE

CITY OF LAS VEGAS, NEVADA

APN: 125-06-701-001, 125-07-501-005, 125-07-602-001,
125-07-602-005, 125-07-501-003, 125-07-501-004



SHEET INDEX		
NO.	SHEET	TITLE
1	CS-1	COVER SHEET
2	CS-2	GENERAL NOTES
3	CS-3	ABBREVIATIONS, LEGEND, AND QUANTITIES
4	PP-1	PLAN & PROFILE I - "WR" 10+00.00 TO "WR" 15+50.00
5	PP-2	PLAN & PROFILE II - "WR" 15+50.00 TO "WR" 22+00.00
6	PP-3	PLAN & PROFILE III - "WR" 22+00.00 TO "WR" 28+50.00
7	PP-4	PLAN & PROFILE IV - "TPI" 9+00.00 TO "TPI" 13+50.00
8	PP-5	PLAN & PROFILE V - "TPI" 13+50.00 TO "TPI" 20+00.00
9	PP-6	PLAN & PROFILE VI - "TPI" 20+00.00 TO "TPI" 24+00.00
10	PP-7	PLAN & PROFILE VII - "BL" 9+00.00 TO "BL" 13+00.00
11	MU	MASTER UTILITY PLAN
12	UT-1	UTILITY PLAN I - "WR" 22+00.00 TO "WR" 28+50.00
13	UT-2	UTILITY PLAN II - "TPI" 9+00.00 TO "TPI" 13+50.00
14	UT-3	UTILITY PLAN III - "TPI" 13+50.00 TO "TPI" 20+00.00
15	UT-4	UTILITY PLAN IV - "TPI" 20+00.00 TO "TPI" 24+00.00
16	UT-5	UTILITY LATERAL I
17	UT-6	WATER EASEMENT I
18	DT-1	DETAIL SHEET I
19	DT-2	DETAIL SHEET II
20	ST-1	SIGNING & STRIPING I - "WR" 9+50 TO "WR" 22+00
21	ST-2	SIGNING & STRIPING II - "WR" 22+00 TO "WR" 26+62
22	ST-3	SIGNING & STRIPING III - "TPI" 9+00 TO "TPI" 22+00
23	LL-1	LIGHTING & ITS I - "WR" 9+50 TO "WR" 22+00
24	LL-2	LIGHTING & ITS II - "WR" 22+00 TO "WR" 26+62
25	LL-3	LIGHTING & ITS III - "TPI" 9+00 TO "TPI" 22+00
26	TS-1	PEDESTRIAN FLASHER PLAN 1
27	TS-2	PEDESTRIAN FLASHER PLAN 2
28	S-1	MODIFIED TYPE CM2 DROP INLET DETAILS
29	HC-1	HORIZONTAL CONTROL PLAN
30	HC-2	HORIZONTAL CONTROL PLAN
31	HC-3	HORIZONTAL CONTROL PLAN
32	HC-4	HORIZONTAL CONTROL PLAN
33	HC-5	HORIZONTAL CONTROL PLAN
34	HC-6	HORIZONTAL CONTROL PLAN
35	HC-7	HORIZONTAL CONTROL PLAN
36	HC-8	HORIZONTAL CONTROL PLAN
37	HC-9	HORIZONTAL CONTROL PLAN
38	HC-10	HORIZONTAL CONTROL PLAN
39	HC-11	HORIZONTAL CONTROL PLAN
40	HC-12	HORIZONTAL CONTROL PLAN
41	HC-13	HORIZONTAL CONTROL PLAN
42	HC-14	HORIZONTAL CONTROL PLAN
43	HC-15	HORIZONTAL CONTROL PLAN
44	HC-16	HORIZONTAL CONTROL PLAN
45	HC-17	HORIZONTAL CONTROL PLAN
46	HC-18	HORIZONTAL CONTROL PLAN
47	HC-19	HORIZONTAL CONTROL PLAN
48	HC-20	HORIZONTAL CONTROL PLAN
49	HC-21	HORIZONTAL CONTROL PLAN
50	HC-22	HORIZONTAL CONTROL PLAN
51	HC-23	HORIZONTAL CONTROL PLAN

NV ENERGY SHEET INDEX ADDENDUM 1		
NO.	SHEET	TITLE
1	---	SHEET 1
2	---	SHEET 2
3	---	SHEET 3
4	---	SHEET 4
5	---	SHEET 5
6	---	SHEET 6
7	---	SHEET 7
8	---	SHEET 8
9	---	SHEET 9
10	---	SHEET 10
11	---	SHEET 11
12	---	SHEET 12
13	---	SHEET 13

OFF-SITE STORM DRAIN SHEET INDEX		
NO.	SHEET	TITLE
1	OS-1	OFF-SITE STORM DRAIN 1
2	OS-2	OFF-SITE STORM DRAIN 2
3	OS-3	OFF-SITE STORM DRAIN 3
4	OS-4	OFF-SITE STORM DRAIN 4
5	OS-5	OFF-SITE STORM DRAIN 5
6	OS-6	OFF-SITE STORM DRAIN 6

BENCHMARK
MONUMENT ID: USDA (1934) 19
U.S. DEPARTMENT OF AGRICULTURE BRASS DISC AT SOUTHWEST CORNER
OF U.S. 95 AND KYLE CANYON ROAD
ELEVATION = 2817.61 FEET, 858.810 METERS
NAVD 83 DATUM
PER THE CITY OF LAS VEGAS BENCHMARK BOOK -
2008 ADJUSTMENT (UPDATED 05/24/2010)

BASIS OF BEARINGS
NORTH 00°15'50" WEST, BEING THE BEARING OF THE EAST LINE OF THE
NORTHEAST QUARTER (NE 1/4) OF SECTION 8, TOWNSHIP 19 SOUTH, RANGE 60
EAST, M.D.M., CITY OF LAS VEGAS, CLARK COUNTY, NEVADA, AS SHOWN BY
MAP THEREON IN FILE 151, PAGE 14 OF SURVEYS IN THE CLARK COUNTY
RECORDER'S OFFICE, NEVADA

FEMA FLOOD ZONE INFORMATION
THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE "X" (OUTSIDE THE 0.2%
ANNUAL CHANCE FLOODPLAIN) ON THE FLOOD INSURANCE RATE MAP (FIRM)
PANELS 32003C1735C AND 32003C1750C BOTH DATED SEPTEMBER 27, 2002



M.O.U. ITEMS
TWP-76718 JULY 23, 2019
NONE

DEVIATIONS FROM STANDARDS
NONE

SWPPP NOTE
NOTE: ALL LAND SURFACE AREA DISTURBANCES OVER 1 ACRE REQUIRE A
STORMWATER DISCHARGE PERMIT ISSUED BY THE NEVADA DIVISION OF ENVIRONMENTAL
PROTECTION (NDPEP). A PHASED CONSTRUCTION UNIT IN A CONTIGUOUS SUBDIVISION IS
CONSIDERED UNDER CONSTRUCTION UNTIL ALL STRIPPED SURFACE AREAS HAVE BEEN
COVERED BY PAVING, BUILDING CONSTRUCTION OR PLANTING. A STORMWATER
DISCHARGE PERMIT APPLICATION AND ASSOCIATED INFORMATION MAY BE DOWNLOADED
FROM THE WEB SITE: [HTTP://WWW.STATE.NV.US/DNRC/STORMWATER.HTM](http://www.state.nv.us/dnrc/stormwater.htm). PROJECTS THAT
DISTURB MORE THAN ONE ACRE OF LAND MUST SUBMIT TO NDPEP A "NOTICE OF
INTENT" FOR INCLUSION UNDER STORMWATER PERMIT NO. NVR1000000 ALONG WITH THE
APPROPRIATE FILING FEE.

GEOTECHNICAL ENGINEER

PREPARED BY: FIRM
ADDRESS: ADDRESS
PHONE: PHONE
PROJECT NO: PROJECT NUMBER
DATED: DATE

APPROVALS

CITY ENGINEERING OFFICE

CITY FIRE & RESCUE

CITY PLANNING DEPARTMENT

CENTRAL TELEPHONE CO DBA CENTURYLINK
DATE
THE AFFIXED CENTURYLINK APPROVAL DOES NOT ASSUME OR GUARANTEE LIABILITY
FOR KNOWN OR UNKNOWN CONFLICTS WITH EXISTING OR PROPOSED IMPROVEMENTS.
RESOLUTION OF ANY CONFLICT WILL BE ACCOMPLISHED PURSUANT TO LOCAL
ORDINANCES, NEVADA REVISED STATUTES AND / OR PUBLIC UTILITY COMMISSION
RULES AND REGULATIONS.

APPROVED FOR CONSTRUCTION

LAS VEGAS VALLEY WATER DISTRICT ENGINEERING SERVICES
PROJECT NO. 137259 - FIRST APPROVED DATE
LVWD APPROVED FIRE FLOW 1,500 GPM AT 20 PSI RESIDUAL
MAXIMUM AVAILABLE FIRE SPRINKLER FLOW 0 GPM
SHEETS: 11, 12, 13, 14

NV ENERGY
DATE

NV ENERGY ACKNOWLEDGES THAT WE HAVE RECEIVED YOUR PLANS AND WILL
PROVIDE SERVICE TO ALL ELECTRICAL NEEDS ASSOCIATED WITH THIS PROJECT. NV
ENERGY RESERVES THE RIGHT TO ADDRESS ANY EXISTING OR FUTURE CONFLICTS
ONCE THE FINAL DESIGN IS COMPLETED. THE NEW SERVICE AND THE RESOLUTION
OF ANY CONFLICTS WILL BE ACCOMPLISHED PURSUANT TO THE NEVADA PUBLIC
UTILITY COMMISSION'S RULES AND REGULATIONS.

SOUTHWEST GAS CORPORATION
SWG UID
DATE

CDX COMMUNICATIONS (LAS VEGAS, INC)
DATE

OWNER

NORTHLAND LLC, EASTLAND LLC, EAST OF
95 LLC, & NINETY FIVE MANAGEMENT, LLC
11411 SOUTHERN HIGHLANDS, SUITE 300
LAS VEGAS, NV 89141
PH: 702-770-5555

DEVELOPER

SC EAST LANDCO, LLC
9275 RUSSELL ROAD, SUITE 400
LAS VEGAS, NV 89148
PH: 702-821-4508

ENGINEER

SLATER HANIFAN GROUP, INC.
a WESTWOOD TEAM
5740 S. ARVILLE STREET, SUITE 216
LAS VEGAS, NV 89118
PH: 702-284-5300
CONTACT: JOSH JOHNSON



DATE	BY	APP	DATE	BY	APP
7/27/19	CS		5/23/20	RM	

CITY OF LAS VEGAS

SC EAST LANDCO, LLC
SUNSTONE PHASE 1
IRON MOUNTAIN ROAD AND TEE PEE LANE
COVER SHEET

DATE: 09/26/19

DRAFTER: SB/JR

DESIGNER: BC

CHECKED: JJ

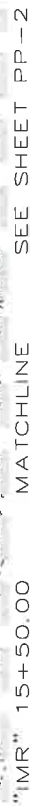
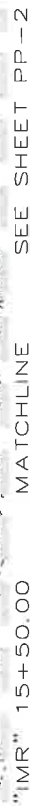
PROJECT NO.
EST1911-000



CS-1

SHEET 1 OF 51

L20-00626
107V8289



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107V8289

SDMH#1 SHIFTED TO EAST;
PIPE LENGTHS AND INVERT
AND RIMS UPDATED

THE PROJECT SITE IS LOCATED WITHIN A FEMA DESIGNATED ZONE X (OUTSIDE THE 0.2% ANNUAL CHANCE FLOOD PLAIN) AS DEPICTED ON FLOOD INSURANCE RATE MAP (FIRM) PANEL 3200JC1735E AND 3200JC1750E, BOTH DATED SEPTEMBER 27, 2002.

FAST
Call before you
UnderGround
1-702-432-5300
FREEWAY & ARTERIAL SYSTEMS

Call before you Dig
AVOID CUTTING UNDERGROUND
UTILITY LINES. IT'S COSTLY.

Call
811
OR
1-800-267-3600



PP-1
SHEET 4 OF 51

APPENDIX B

Storm Drain Computations

T1 EST1911: SUNSTONE IM & TP									
T2 MAINLINE (MAIN)									
T3 PROPOSED DRAINAGE CONDITION									
SO	1000.0002705.000	30				2706.970			
R	1132.7502706.064	30	.013				0.0		
WE	1132.7502706.064	1							
R	1133.7502706.072	1	.015				0.0		
JX	1134.7502706.080	1	.015	0.1		2706.080	90.0		
R	1136.7502706.160	1	.015				0.0		
WX	1136.7502706.160	30							
R	1525.4802721.730	30	.013				0.0	1	
R	1916.2102733.850	30	.013				0.0	1	
R	2305.6702745.128	30	.013				6.0	1	
JX	2308.1702745.200	30	.013	14.0		2745.700	37.0		
R	2480.3602749.517	30	.013				12.0	1	
R	2481.1932749.538	30	.013				12.0		
R	2482.0272749.559	30	.013				11.0		
R	2482.8602749.580	30	.013				11.0		
R	2648.9502754.280	30	.013				5.0	1	
R	2898.9502758.640	30	.013				4.0	1	
R	3068.9502761.030	30	.013				5.0	1	
R	3220.4202762.958	30	.013				15.0	1	
R	3221.6702762.974	30	.013				15.0		
R	3222.9202762.990	30	.013				15.0		
R	3253.1102763.140	30	.013				15.0		
SH	3253.1102763.140	30							
CD	24	4	1	0.000	2.000	0.000	0.000	0.000	0.00
CD	30	4	1	0.000	2.500	0.000	0.000	0.000	0.00
CD	1	3	0	0.000	5.000	3.500	0.000	0.000	0.00
Q				25.000					

W S P G W - EDIT LISTING - Version 14.10
 WATER SURFACE PROFILE - CHANNEL DEFINITION LISTING

CARD	SECT	CHN	NO OF	AVE PIER	HEIGHT 1	BASE	ZL	ZR	INV	Y(1)	Y(2)	Y(3)	Y(4)	Y(5)	Y(6)	Y(7)	Y(8)	Y(9)	Y(10)
CODE	NO	TYPE	PIER/PIP	WIDTH	DIAMETER	WIDTH			DROP										

CD	24	4	1		2.000														
CD	30	4	1		2.500														
CD	1	3	0		.000	5.000	3.500	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000	.000

W S P G W

WATER SURFACE PROFILE - TITLE CARD LISTING

HEADING LINE NO 1 IS -

HEADING LINE NO 2 IS -

HEADING LINE NO 3 IS -

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

W S P G W

WATER SURFACE PROFILE - ELEMENT CARD LISTING

ELEMENT NO	1	IS A	SYSTEM OUTLET	STATION	INVERT	SECT	W S ELEV	RADIUS	ANGLE	ANG PT	MAN H
ELEMENT NO	1	IS A	SYSTEM OUTLET	1000.000	2705.000	30	2706.970	.000	.000	.000	0
ELEMENT NO	2	IS A	REACH	STATION	INVERT	SECT					
			U/S DATA	1132.750	2706.064	30					
ELEMENT NO	3	IS A	WALL ENTRANCE	STATION	INVERT	SECT					
			U/S DATA	1132.750	2706.064	1					
ELEMENT NO	4	IS A	REACH	STATION	INVERT	SECT					
			U/S DATA	1133.750	2706.072	1					
ELEMENT NO	5	IS A	JUNCTION	STATION	INVERT	SECT					
			U/S DATA	1134.750	2706.080	1					
ELEMENT NO	6	IS A	REACH	STATION	INVERT	SECT					
			U/S DATA	1136.750	2706.160	1					
ELEMENT NO	7	IS A	WALL EXIT	STATION	INVERT	SECT					
			U/S DATA	1136.750	2706.160	30					
ELEMENT NO	8	IS A	REACH	STATION	INVERT	SECT					
			U/S DATA	1525.480	2721.730	30					
ELEMENT NO	9	IS A	REACH	STATION	INVERT	SECT					
			U/S DATA	1916.210	2733.850	30					
ELEMENT NO	10	IS A	REACH	STATION	INVERT	SECT					
			U/S DATA	2305.670	2745.128	30					
ELEMENT NO	11	IS A	JUNCTION								

U/S DATA				MAIN.EDT										
				Q4	INVERT-3			INVERT-4			PHI 3	PHI 4		
STATION				INVERT	SECT	LAT-1	LAT-2	N	Q3	RADIUS			ANGLE	
2308.170				2745.200	30	24	0	.013	14.000	.000	2745.700	.000	37.000	.000
WATER SURFACE PROFILE - ELEMENT CARD LISTING														
W S P G W														
ELEMENT NO	12 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	2480.360	2749.517	30	*			.013		.000	.000	12.000	1	
ELEMENT NO	13 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	2481.193	2749.538	30	*			.013		.000	.000	12.000	0	
ELEMENT NO	14 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	2482.027	2749.559	30	*			.013		.000	.000	11.000	0	
ELEMENT NO	15 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	2482.860	2749.580	30	*			.013		.000	.000	11.000	0	
ELEMENT NO	16 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	2648.950	2754.280	30	*			.013		.000	.000	5.000	1	
ELEMENT NO	17 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	2898.950	2758.640	30	*			.013		.000	.000	4.000	1	
ELEMENT NO	18 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	3068.950	2761.030	30	*			.013		.000	.000	5.000	1	
ELEMENT NO	19 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	3220.420	2762.958	30	*			.013		.000	.000	15.000	1	
ELEMENT NO	20 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	3221.670	2762.974	30	*			.013		.000	.000	15.000	0	
ELEMENT NO	21 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	3222.920	2762.990	30	*			.013		.000	.000	15.000	0	
ELEMENT NO	22 IS A REACH	STATION	INVERT	SECT				N		RADIUS	ANGLE	ANG PT	MAN H	
	U/S DATA	3253.110	2763.140	30	*			.013		.000	.000	.000	0	
ELEMENT NO	23 IS A SYSTEM HEADWORKS	STATION	INVERT	SECT						W S ELEV				
	U/S DATA	3253.110	2763.140	30					*	.000				

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.-FT	Height/ or I.D.	Base Wt	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch	
1000.000	2705.000	2.109	2707.109	39.10	8.85	1.22	2708.33	.00	2.11	1.82	2.500	.000	.00	1	.0
52.939	.0080					.0083	.44	2.11	1.00	2.24	.013	.00	.00	PIPE	
1052.939	2705.424	2.237	2707.662	39.10	8.44	1.11	2708.77	.00	2.11	1.53	2.500	.000	.00	1	.0
79.811	.0080					.0080	.64	2.24	.86	2.24	.013	.00	.00	PIPE	
1132.750	2706.064	2.243	2708.307	39.10	8.42	1.10	2709.41	.00	2.11	1.52	2.500	.000	.00	1	.0
WALL ENTRANCE															
1132.750	2706.064	4.102	2710.166	39.10	2.72	.12	2710.28	.00	1.57	3.50	5.000	3.500	.00	0	.0
1.000	.0081					.0006	.00	4.10	.24	1.46	.015	.00	.00	BOX	
1133.750	2706.072	4.094	2710.166	39.10	2.73	.12	2710.28	.00	1.57	3.50	5.000	3.500	.00	0	.0
JUNCT STR	.0081					.0006	.00	4.09	.24		.015	.00	.00	BOX	
1134.750	2706.080	4.087	2710.167	39.00	2.73	.12	2710.28	.00	1.57	3.50	5.000	3.500	.00	0	.0
2.000	.0399					.0006	.00	4.09	.24	.83	.015	.00	.00	BOX	
1136.750	2706.160	4.003	2710.163	39.00	2.78	.12	2710.28	.00	1.57	3.50	5.000	3.500	.00	0	.0
WALL EXIT															
1136.750	2706.160	4.004	2710.163	39.00	7.95	.98	2711.14	.00	2.11	.00	2.500	.000	.00	1	.0
12.729	.0401					.0090	.12	4.00	.00	1.21	.013	.00	.00	PIPE	
1149.479	2706.670	3.610	2710.279	39.00	7.95	.98	2711.26	.00	2.11	.00	2.500	.000	.00	1	.0
HYDRAULIC JUMP															

MAIN.OUT

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.	Height/FT or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
1149.479	2706.670	1.213	2707.883	39.00	16.51	4.23	2712.12	.00	2.11	2.50	2.500	.000	.00	1 .0
53.384	.0401					.0401	2.14	1.21	2.99	1.21	.013	.00	.00	PIPE
1202.863	2708.808	1.213	2710.021	39.00	16.51	4.23	2714.25	.00	2.11	2.50	2.500	.000	.00	1 .0
141.936	.0401					.0400	5.68	1.21	2.99	1.21	.013	.00	.00	PIPE
1344.798	2714.493	1.214	2715.707	39.00	16.50	4.23	2719.93	.00	2.11	2.50	2.500	.000	.00	1 .0
137.353	.0401					.0376	5.16	1.21	2.99	1.21	.013	.00	.00	PIPE
1482.151	2719.994	1.260	2721.254	39.00	15.73	3.84	2725.10	.00	2.11	2.50	2.500	.000	.00	1 .0
43.329	.0401					.0331	1.43	1.26	2.78	1.21	.013	.00	.00	PIPE
1525.480	2721.730	1.308	2723.038	39.00	15.00	3.49	2726.53	.00	2.11	2.50	2.500	.000	.00	1 .0
245.368	.0310					.0310	7.61	1.31	2.59	1.31	.013	.00	.00	PIPE
1770.848	2729.341	1.308	2730.649	39.00	15.00	3.49	2734.14	.00	2.11	2.50	2.500	.000	.00	1 .0
145.362	.0310					.0300	4.36	1.31	2.59	1.31	.013	.00	.00	PIPE
1916.210	2733.850	1.336	2735.186	39.00	14.61	3.32	2738.50	.00	2.11	2.49	2.500	.000	.00	1 .0
85.137	.0290					.0290	2.47	1.34	2.49	1.34	.013	.00	.00	PIPE
2001.347	2736.315	1.336	2737.651	39.00	14.61	3.32	2740.97	.00	2.11	2.49	2.500	.000	.00	1 .0
146.108	.0290					.0280	4.09	1.34	2.49	1.34	.013	.00	.00	PIPE
2147.455	2740.546	1.364	2741.910	39.00	14.24	3.15	2745.06	.00	2.11	2.49	2.500	.000	.00	1 .0
66.286	.0290					.0255	1.69	1.36	2.39	1.34	.013	.00	.00	PIPE

FILE: MAIN.WSW

Program Package Serial Number: 7189

W S P G W - CIVILDESIGN Version 14.08

WATER SURFACE PROFILE LISTING

Date: 8- 9-2021 Time: 6:33:45

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

MAIN, OUT

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.	Height/ Base or I.D.	ZL	No Wth Prs/Pip		
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch		

2213.741	2742.466	1.418	2743.884	39.00	13.57	2.86	2746.74	.00	2.11	2.48	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
31.419	.0290					.0225	.71	1.42	2.22	1.34	.013	.00	.00	PIPE		
2245.160	2743.376	1.475	2744.851	39.00	12.94	2.60	2747.45	.00	2.11	2.46	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
19.449	.0290					.0199	.39	1.47	2.06	1.34	.013	.00	.00	PIPE		
2264.609	2743.939	1.535	2745.474	39.00	12.34	2.36	2747.84	.00	2.11	2.43	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
13.332	.0290					.0176	.23	1.53	1.91	1.34	.013	.00	.00	PIPE		
2277.941	2744.325	1.599	2745.924	39.00	11.77	2.15	2748.07	.00	2.11	2.40	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
9.572	.0290					.0156	.15	1.60	1.76	1.34	.013	.00	.00	PIPE		
2287.514	2744.602	1.667	2746.269	39.00	11.22	1.95	2748.22	.00	2.11	2.36	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
6.960	.0290					.0139	.10	1.67	1.63	1.34	.013	.00	.00	PIPE		
2294.474	2744.804	1.740	2746.543	39.00	10.70	1.78	2748.32	.00	2.11	2.30	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
5.008	.0290					.0124	.06	1.74	1.50	1.34	.013	.00	.00	PIPE		
2299.481	2744.949	1.818	2746.767	39.00	10.20	1.62	2748.38	.00	2.11	2.23	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
3.429	.0290					.0111	.04	1.82	1.37	1.34	.013	.00	.00	PIPE		
2302.910	2745.048	1.904	2746.952	39.00	9.72	1.47	2748.42	.00	2.11	2.13	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
2.049	.0290					.0100	.02	1.90	1.25	1.34	.013	.00	.00	PIPE		
2304.959	2745.107	1.998	2747.106	39.00	9.27	1.33	2748.44	.00	2.11	2.00	2.500	.000	.00	1	.0	
	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	-		
.710	.0290					.0091	.01	2.00	1.13	1.34	.013	.00	.00	PIPE		

W S P G W - CIVILDDESIGN Version 14.08																

▲ FILE: MAIN.WSW

W S P G W - CIVILDESIGN Version 14.08

Program Package Serial Number: 7189

WATER SURFACE PROFILE LISTING

Date: 8- 9-2021 Time: 6:33:45

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel	Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Dia.	Height/FT or I.D.	Base Wt	ZL	No Wth Prs/Pip
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****

MAIN.OUT														
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
2305.670	2745.128	2.107	2747.234	39.00	8.84	1.21	2748.45	.00	2.11	1.82	2.500	.000	.00	1 .0
JUNCT STR	.0288					.0062	.02	2.11	1.00		.013	.00	.00	PIPE
2308.170	2745.200	3.166	2748.365	25.00	5.09	.40	2748.77	.00	1.70	.00	2.500	.000	.00	1 .0
27.908	.0251					.0037	.10	3.17	.00	1.08	.013	.00	.00	PIPE
2336.078	2745.900	2.587	2748.487	25.00	5.09	.40	2748.89	.00	1.70	.00	2.500	.000	.00	1 .0
HYDRAULIC JUMP														
2336.078	2745.900	1.076	2746.976	25.00	12.37	2.38	2749.35	.00	1.70	2.48	2.500	.000	.00	1 .0
29.354	.0251					.0251	.74	1.08	2.41	1.08	.013	.00	.00	PIPE
2365.432	2746.636	1.076	2747.712	25.00	12.37	2.38	2750.09	.00	1.70	2.48	2.500	.000	.00	1 .0
114.928	.0251					.0264	3.03	1.08	2.41	1.08	.013	.00	.00	PIPE
2480.360	2749.517	1.046	2750.563	25.00	12.84	2.56	2753.12	.00	1.70	2.47	2.500	.000	.00	1 .0
.833	.0252					.0278	.02	1.05	2.55	1.07	.013	.00	.00	PIPE
2481.193	2749.538	1.046	2750.584	25.00	12.85	2.56	2753.15	.00	1.70	2.47	2.500	.000	.00	1 .0
.834	.0252					.0278	.02	1.05	2.55	1.07	.013	.00	.00	PIPE
2482.027	2749.559	1.045	2750.604	25.00	12.86	2.57	2753.17	.00	1.70	2.47	2.500	.000	.00	1 .0
.833	.0252					.0279	.02	1.05	2.55	1.07	.013	.00	.00	PIPE
2482.860	2749.580	1.045	2750.625	25.00	12.86	2.57	2753.19	.00	1.70	2.47	2.500	.000	.00	1 .0
86.417	.0283					.0268	2.32	1.04	2.55	1.04	.013	.00	.00	PIPE
W S P G W - CIVILDESIGN Version 14.08														
FILE: MAIN.MSW PAGE														

W S P G W - CIVILDESIGN Version 14.08
 Program Package Serial Number: 7189
 WATER SURFACE PROFILE LISTING

Date: 8- 9-2021 Time: 6:33:45

EST1911: SUNSTONE IM & TP

MAINLINE (MAIN)

PROPOSED DRAINAGE CONDITION

Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Height/Dia.-FT	Base Wt or I.D.	No Wth Prs/Pip	
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch

MAIN, OUT														
2569.277	2752.026	1.069	2753.095	25.00	12.48	2.42	2755.51	.00	1.70	2.47	2.500	.000	.00	1 .0
43.046	.0283	- -	- -	- -	- -	.0241	1.04	1.07	2.44	1.04	.013	.00	.00	PIPE
2612.323	2753.244	1.109	2754.352	25.00	11.90	2.20	2756.55	.00	1.70	2.48	2.500	.000	.00	1 .0
22.305	.0283	- -	- -	- -	- -	.0212	.47	1.11	2.28	1.04	.013	.00	.00	PIPE
2634.628	2753.875	1.150	2755.025	25.00	11.34	2.00	2757.02	.00	1.70	2.49	2.500	.000	.00	1 .0
14.322	.0283	- -	- -	- -	- -	.0186	.27	1.15	2.13	1.04	.013	.00	.00	PIPE
2648.950	2754.280	1.193	2755.473	25.00	10.81	1.82	2757.29	.00	1.70	2.50	2.500	.000	.00	1 .0
90.448	.0174	- -	- -	- -	- -	.0174	1.58	1.19	1.98	1.19	.013	.00	.00	PIPE
2739.398	2755.857	1.193	2757.050	25.00	10.81	1.82	2758.87	.00	1.70	2.50	2.500	.000	.00	1 .0
115.115	.0174	- -	- -	- -	- -	.0167	1.92	1.19	1.98	1.19	.013	.00	.00	PIPE
2854.513	2757.865	1.224	2759.089	25.00	10.46	1.70	2760.79	.00	1.70	2.50	2.500	.000	.00	1 .0
44.437	.0174	- -	- -	- -	- -	.0150	.67	1.22	1.89	1.19	.013	.00	.00	PIPE
2898.950	2758.640	1.271	2759.910	25.00	9.98	1.55	2761.46	.00	1.70	2.50	2.500	.000	.00	1 .0
59.935	.0141	- -	- -	- -	- -	.0141	.84	1.27	1.76	1.27	.013	.00	.00	PIPE
2958.885	2759.483	1.271	2760.753	25.00	9.98	1.55	2762.30	.00	1.70	2.50	2.500	.000	.00	1 .0
110.065	.0141	- -	- -	- -	- -	.0133	1.47	1.27	1.76	1.27	.013	.00	.00	PIPE
3068.950	2761.030	1.312	2762.343	25.00	9.58	1.42	2763.77	.00	1.70	2.50	2.500	.000	.00	1 .0
92.221	.0127	- -	- -	- -	- -	.0119	1.10	1.31	1.65	1.31	.013	.00	.00	PIPE
FILE: MAIN.WSW														
W S P G W - CIVILDESIGN Version 14.08														
Program Package Serial Number: 7189														
WATER SURFACE PROFILE LISTING														
EST1911: SUNSTONE IM & TP														
MAINLINE (MAIN)														
PROPOSED DRAINAGE CONDITION														
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Top Width	Height/ Dia.-FT	Base Wt or I.D.	ZL	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
3161.171	2762.204	1.359	2763.563	25.00	9.17	1.31	2764.87	.00	1.70	2.49	2.500	.000	.00	1 .0
- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -

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MAIN.OUT													
30.587	.0127					.0106	.32	1.36	1.54	1.31	.013	.00	PIPE
3191.758	2762.593	1.412	2764.005	25.00	8.74	1.19	2765.19	.00	1.70	2.48	2.500	.000	1 .0
15.267	.0127					.0094	.14	1.41	1.43	1.31	.013	.00	PIPE
3207.025	2762.788	1.469	2764.256	25.00	8.34	1.08	2765.34	.00	1.70	2.46	2.500	.000	1 .0
8.611	.0127					.0083	.07	1.47	1.33	1.31	.013	.00	PIPE
3215.636	2762.897	1.529	2764.426	25.00	7.95	.98	2765.41	.00	1.70	2.44	2.500	.000	1 .0
4.784	.0127					.0073	.04	1.53	1.23	1.31	.013	.00	PIPE
3220.420	2762.958	1.592	2764.550	25.00	7.58	.89	2765.44	.00	1.70	2.40	2.500	.000	1 .0
1.250	.0129					.0067	.01	1.59	1.14	1.30	.013	.00	PIPE
3221.670	2762.974	1.622	2764.596	25.00	7.42	.85	2765.45	.00	1.70	2.39	2.500	.000	1 .0
.323	.0127					.0065	.00	1.62	1.10	1.31	.013	.00	PIPE
3221.992	2762.978	1.632	2764.610	25.00	7.36	.84	2765.45	.00	1.70	2.38	2.500	.000	1 .0
.927	.0127					.0061	.01	1.63	1.09	1.31	.013	.00	PIPE
3222.920	2762.990	1.704	2764.694	25.00	7.02	.76	2765.46	.00	1.70	2.33	2.500	.000	1 .0
14.490	.0050					.0054	.08	1.70	1.00	1.80	.013	.00	PIPE
3237.409	2763.062	1.779	2764.841	25.00	6.69	.70	2765.54	.00	1.70	2.26	2.500	.000	1 .0
15.701	.0050					.0050	.08	1.78	.92	1.80	.013	.00	PIPE
W S P G W - CIVILDESIGN Version 14.08													
FILE: MAIN.WSW													

FILE: MAIN.WSW
 Program Package Serial Number: 7189
 W S P G W - CIVILDESIGN Version 14.08
 Date: 8- 9-2021 Time: 6:33:45
 WATER SURFACE PROFILE LISTING

EST1911: SUNSTONE IM & TP														
MAINLINE (MAIN)														
PROPOSED DRAINAGE CONDITION														
Station	Invert Elev	Depth (FT)	Water Elev	Q (CFS)	Vel (FPS)	Vel Head	Energy Grd.El.	Super Elev	Critical Depth	Flow Width	Top Width	Height/Dia.	Base Wt or I.D.	No Wth Prs/Pip
L/Elem	Ch Slope					SF Ave	HF	SE Dpth	Froude N	Norm Dp	"N"	X-Fall	ZR	Type Ch
3253.110	2763.140	1.787	2764.927	25.00	6.66	.69	2765.62	.00	1.70	2.26	2.500	.000	.00	1 .0

APPENDIX C

Improvement Plans